burned at sea; and three persons, A, B, C, whose respective veracities are $\frac{3}{4}$, $\frac{4}{5}$, and $\frac{5}{6}$, report as follows: A, that the lost vessel was an iron steamer; B, that it was not a sailing vessel; and C, that it was a sailing vessel. Required the expectation of loss to the underwriter, the *a priori* probability of destruction by fire being twice as great in case of a steamer as of a sailing vessel."

SOLUTION BY HENRY HEATON, B. S., DES MOINES, IOWA.

Before receiving the testimony of either A, B or C the chances of burning of the different vessels were as 2, 2, and 1; after A's testimony they were as 6, 2, and 1; after B's, as 24, 8, and 1, and after C's, as 24, 8, and 5, taking them in the order in which they are named in the problem.

Hence the chances of the burning of the different vessels are $\frac{24}{37}$, $\frac{8}{37}$ and $\frac{5}{37}$; and the expectation of loss is $\frac{24}{37}$ of \$20000 + $\frac{8}{37}$ of \$15000 + $\frac{5}{37}$ of \$10000 = \$17567.56$\frac{28}{37}$.

PROBLEMS.

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151. BY A. W. MASON, CEDAR FALLS, IOWA.—What is the altitude of the maximum cylinder which can be inscribed in a given paraboloid?

152. BY G. M. DAY, LOCKPORT, N. Y.— Find the surface of a right conoid with a circular base.

153. BY J. B. MOTT, NEOS., MO.—Prove that if $(1+0\times\frac{1}{6}x\sqrt{-1})^{1\div 0}-(1-0\times\frac{1}{6}x\sqrt{-1})^{1\div 0}=\sqrt{-1}\ldots(1)$, $x=[(2\sqrt{-1})\div 0][(1+\sqrt{-1})^0-(1-\sqrt{-1})^0]\ldots(2)$; and find the real approximate value of x.

154. BY PROF. O. PRATT, SEN., SALT LAKE CITY, UTAH. — Find a general logarithmic theorem for the differentiation of

$$u = z^{x_1^{x_2^{\cdot^{\cdot^{\cdot^{x_n}}}}}},\ z,\ x_1,\ x_2, \text{ \&c., being any functions}$$

of one variable as x.

155. BY PROF. C. BANCROFT, HIRAM, OHIO. — To find the least distance (in miles on the earth's surface) between two places given by latitude and longitude, taking into account the polar compression.

156. BY PROF. JOHNSON. — In a determinant of the nth degree the elements of the principal diagonal consist of units, and of the remaining elements those in the first column are each equal to a, those in the second column each equal to b and so on. Evaluate the determinant.

157. By Christine Ladd. — What is the entire number of double points which can be assumed arbitrarily on a curve of the nth degree?

158. By R. J. Adcock. — Let two concentric and similarly placed ellipses, infinitely near each other, be described, the semi-axes of the inner being a and b, and those of the outer $a + da$, and $b + da$; show that the minimum distance between their perimeters $= 2\sqrt{(ab)}da \div (a+b)$.

159. By Artemas Martin. — The first of two casks contains a gallons of wine and b gallons of water, and the second contains c gallons of wine and d gallons of water. e gallons are taken from the first and poured into the second cask, and then e gallons are taken from the second cask and poured into the first.

Required the quantity of wine in the second cask after n such operations as the one described above.

160. By Prof. A. Hall. — P and Q being functions of x find the conditions that the equation $ydy + (P - Qy)dx = 0$, is made integrable by the factor $\frac{y}{[y + f(x)]^n}$, and determine the form of $f(x)$.

161. By E. B. Seitz. — Two equal circles, radii r, are drawn on the surface of a circle, radius $2r$; find the average of the area common to the two circles.

Query, by W. E. Heal, Wheeling, Indiana. — On page 149 of Chauvenet's Geometry it is stated, "That it is possible, by the use of the straigt line and circle only, to construct regular polygons of 17 sides, of 257 sides, and in general of any number of sides which can be expressed by 2^n+1, n being an integer, provided that 2^n+1 is a prime number." How is this demonstrated?

ERRATA.

On page 20, line 11, eq. (3), for $(b^2 \div a^2,)$ in denominator, read $(b^4 \div a^4)$.
" 22, " 7, " $a\alpha + b\beta$, " " " $c\gamma + b\beta$.
" " " 15, " $c\gamma + a\gamma$, " " " $c\gamma + a\alpha$.
" " " 15, " $a\alpha - b\gamma$, " numerator " $a\alpha - b\beta$.
" 39, " 7 from bottom, for $nr+n = t_n$, read $nr+m = t_n$.
" 51, " 3 & 4 from bottom, for d read $d_{\prime}$.
" 52, " 1, for $\delta = d_{\prime}^2 P(4)$, read $\delta^2 = d_{\prime}^2 P(4)$.
" " " 7, " 140800000, in numerator, read $140800000\delta^2$.
" 53, " 7, " $-(b^2+12d)^3$, " $-4(b^2+12d)^3$.